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The "click-on-tube" approach for the production of efficient drug carriers based on oxidized multi-walled carbon nanotubes

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Abstract

© 2016 The Royal Society of Chemistry.To demonstrate the potential of azido-substituted carbon nanotubes for application in nanomedicine, multiple-decorated oxidized multi-walled carbon nanotubes as drug delivery systems have been synthesized. These DDSs were able to carry doxorubicin inside breast MCF-7 cancer cell lines resulting in an enhanced cytotoxic effect with respect to the free drug. Decoration of the carbon nanotubes was accomplished through both covalent and non-covalent approaches: versatile click reactions and π-π interactions were exploited. To assess the internalization of the carbon nanotubes inside cells, decoration with a BODIPY fluorescent molecule was performed. Furthermore, the nanotubes were decorated with a biotin selector molecule to increase the uptake of the system by cancer cells. Comparative studies were performed on the complete drug delivery system to highlight its effect with respect to the free drug and the contribution of the selector in the internalization efficiency. Finally, preliminary in vivo tests were performed on MCF-7 inoculated mice. A net improvement in efficiency, concerning the minor growth of the tumors, has been found when using doxorubicin loaded on our drug delivery system with respect to free doxorubicin.

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